PROCEDURE 9 - Compressed Gas Safety

Table of Contents Page

Synopsis

The purpose of this procedure is to provide guidelines for hazards associated with the use, handling and storage of compressed gases. This procedure applies to all NWS facilities and work locations where compressed gases are used and/or stored, and to the employees using compressed gases.

Initial Implementation Requirements:

- **Analyze Site Operations versus Requirements of the Procedure**
- **Develop/Obtain Documentation/Information required for Site**
  - Obtain Copies of Material Safety Data Sheets for Compressed Gases. *(9.5.3d)*
- **Designate Person to Administer Compressed Gas Safety Procedure Requirements**
- **Provide Local Training of Site Personnel**
  - Hydrogen Generator Training, if applicable. *(9.3.6a)*
  - Training of personnel working with Compressed Gas Cylinders. (*9.5.3b)*
  - Fire Extinguisher Use Training (if Emergency Action Plan (Procedure #5) calls for employees fighting the fire). *(9.5.2c, 9.3.1u)*
- **Inventory Material/Equipment (Procure as required)**
  - Warning Signs *(9.5.3c, 9.3.1u, 9.3.5e)*

Recurring and Annual Task Requirements:

- **Perform Inspections/Assessment/Testing**
- **Review/Update Documentation/Information required for Site**
  - Maintain Training Records for personnel handling Compressed Gases. (*9.5.2b)*
- **Provide Refresher Training of Site Personnel (If Applicable)**
  - Hydrogen Generator Training. *(9.3.6a)*, as required
  - Training of personnel working with Compressed Gas Cylinders. (*9.5.3b)*
  - Fire Extinguisher Use Training (if Emergency Action Plan calls for employees fighting the fire). *(9.5.2c, 9.3.1u)*
- **Replace/Maintain Material/Equipment**
  - Warning Signs *(9.5.3c, 9.3.1u, 9.3.5e)*

Compressed Gas Safety Checklist

Requirements	EHB 15 Reference	YES	NO	N/A	Comments
Is initial and annual review of this procedure conducted and documented?	9.4.2				
Do only "Qualified Personnel" handle, use, and store compressed gas cylinders?	9.3.1a				
Have employees working with Hydrogen Generator systems received appropriate training?	9.3.6a				
Are periodic Inspections of Compressed Gas storage and usage areas performed and deficiencies corrected?	9.5.3b				
Are all Cylinders visually inspected upon delivery?	9.3.1b				
Are all Cylinders legibly marked to identify the gas contained?	9.3.1f				
Are all empty Cylinders marked as "empty"?	9.3.1s				
Are work areas maintained in clean and orderly condition?	9.3.1d				
Are "No Smoking" signs posted inside storage areas and at the entrances to storage areas?	9.3.1u				

Requirements	EHB 15 Reference	YES	NO	N/A	Comments
Are hydrogen storage areas marked with "Hydrogen-Flammable Gas - No Smoking - No Open Flames"	9.3.5e				
Are Material Safety Data Sheets available for all compressed gases used?	9.5.3c				
Are Cylinders handled, stored and used appropriately depending on the type of gas used?	9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5				
Are adequate fire extinguishers available for fire emergencies at storage areas?	9.3.1t				

9 COMPRESSED GAS SAFETY

9.1 Purpose and Scope

As part of its goal to provide a safe and healthful workplace, the National Weather Service (NWS) is implementing this procedure related to the hazards associated with the use, handling and storage of compressed gases. This procedure applies to all NWS facilities, work locations, and employees where compressed gases are used and/or stored.

9.2 Definitions

Compressed Gas. Any material or mixture contained at a pressure of 40 psi at 70° F or 104 psi at 13° F. Any liquid material having a pressure exceeding 40 psi at 100° F.

Field Office. A Field Office may include the following: Weather Forecast Office (WFO), River Forecast Center (RFC), Weather Service Office (WSO), and a Data Collection Office (DCO).

Handling. An activity in which the employee is involved in the storage, transportation or use of compressed gas cylinders.

Housekeeping. Maintaining the general cleanliness of the work area, which includes the proper and safe storage of all compressed gas cylinders.

Inflation Gas System. A system in which gas is delivered, stored and discharged to consumer piping. The system includes stationary or moveable containers, pressure regulators, safety relief devices, interconnection piping and controls.

Operating Unit. For the purpose of this procedure, Operating Unit includes the National Centers for Environmental Prediction (NCEP), National Data Buoy Center (NDBC), NWS Training Center (NWSTC), National Reconditioning Center (NRC), Radar Operations Center (ROC), or the Sterling Research & Development Center (SR&DC).

Personal Protective Equipment (PPE). Safety devices worn by the workers to protect against hazards in the environment.

Qualified Employee. A person who has received specific training in the inspection, storage, and use of compressed gases.

Station Manager. For the purpose of this procedure, the Station Manager shall be either the NWS Regional Director; Directors of Centers under NCEP (Aviation Weather Center, NP6; Storm Prediction Center, NP7; and Tropical Prediction Center, NP8); Directors of the NDBC, NWSTC, and Chiefs of NRC, ROC and SR&DC facilities; or Meteorologist in Charge (MIC), Hydrologist in Charge (HIC), or Official in Charge (OIC).

9.3 Procedure

9.3.1 Compressed Gases - General Instructions

a. Only qualified employees shall handle, use and store compressed gas cylinders.

b. Employees shall visually inspect compressed gas cylinders upon delivery and before each use. Damaged cylinders shall be marked and the supplier shall be contacted to arrange for disposal.

c. Smoking, eating or drinking shall be prohibited in compressed gas storage and working areas.

d. Work and storage areas shall be kept in clean and orderly condition at all times.

e. Employees shall ensure that the compressed containers with which they are working carry legible labels or markings identifying the contents. The primary means of identification shall be by chemical name or the commercially accepted name of the material legibly marked on the container.

f. Containers not bearing any legible written identification shall not be used and shall be picked up by the supplier.

g. Compressed gas cylinders shall not be rolled or stored on their side, dragged or slid.

h. Compressed gas cylinders shall be stored in accordance with all state and local regulations and in accordance with OSHA, National Fire Protection Association (NFPA) and the Compressed Gas Association (CGA).

i. Where removable caps are provided by the supplier for valve protection, the user shall keep such caps on containers, except when containers are connected to dispersing units.

j. Compressed gas cylinders shall be stored upright (valve end up) and shall be secured with approved restraining device.

k. The user shall keep container valves closed at all times when not in use.

l. Compressed gas cylinders shall not be subjected to indoor temperatures above 125° F (51° C).

m. Storage areas shall be dry and well ventilated and built of a fire-resistant material. Combustible materials shall not be stored within 20 feet (6.1 meters) of compressed gas cylinders.

n. Where compressed gas cylinders are connected to a manifold system, the manifold and its related equipment shall be of a proper design for the products they are to contain.

NOTE: *A manifold system shall not be used with hydrogen.*

o. Regulators, gauges, hoses and other appliances provided for use with a particular gas, or groups of gases shall not be used on containers containing

gases having different chemical properties unless information obtained from the supplier indicates that it is permissible.

p. Valves should be opened slowly and pointed away from persons or sources of ignition. On valves without wheels, only non-sparking wrenches provided by or recommended by the supplier shall be used.

q. Connections to piping, regulators and other appliances shall be tight to prevent leakage. If leak is suspected, a gas detection fluid, soapy water or other commercially available solution shall be used for leak detection (e.g., "Snoop" leak detection solution).

r. Release of gas pressure within system shall be done before removal of appliances, hoses or regulators.

s. Empty cylinders shall be legibly marked as empty.

t. Adequate portable fire extinguishers of carbon dioxide or dry chemical types shall be available for fire emergencies at storage areas .

u. "No Smoking" signs shall be posted in the storage areas and entrances to storage areas.

v. Each cylinder bearing a DOT specification marking must be inspected, re-tested and marked in conformance with 49 CFR 173.34, "Qualifications, Maintenance and Use of Cylinders."

w. Cylinders shall not be lifted by their caps.

9.3.2 Oxygen compressed gases

a. Containers, valves, regulators, hose and oxygen appliances shall be free from oil or grease and shall not be handled with oily hands, oily gloves or with greasy equipment.

b. Oxygen containers shall be separated from flammable gas containers or combustible materials a minimum of 20 feet or by a noncombustible barrier at least 5 feet high having a fire resistance rating of at least ½ hour.

c. Bulk oxygen storage systems shall be located above ground and outdoors, or shall be installed in a building of noncombustible construction, adequately vented, and used for that purpose only.

9.3.3 Acetylene compressed gases

a. In-plant transfer, storage, and utilization of acetylene cylinders shall be in accordance with Compressed Gas Association Pamphlet G-1, Acetylene, 1996.

b. Acetylene tanks shall be transported, stored and utilized only in an upright position.

c. Only regulators designed for acetylene gases shall be used on acetylene tanks.

d. Storage near oxidizers shall be prohibited.

9.3.4 Liquified petroleum gases. (LPG)

a. Storage of LPG within buildings is prohibited.

b. When stored outside of buildings, containers awaiting use shall be located away from the nearest building or group of buildings, in accordance with the following:

Quantity of LP-Gas Stored	Distance (feet)
500 lbs. or less	0
501 to 6,000 lbs.	10
6,001 to 10,000 lbs.	20
Over 10,000 lbs.	25

c. Containers shall be stored in a suitable ventilated enclosure or otherwise protected against tampering.

d. Storage locations shall be provided with at least one approved portable fire extinguisher having a rating of not less than 20-B:C.

9.3.5 Hydrogen Compressed Gases. Specific procedures for filling weather balloons with hydrogen can be found in Observing Handbook No.10 (WSOH-10), Rawisonde Observations, Federal Meteorological Handbook No.3 (FMH-3), Rawisonde and Pibal Observations and NWS Operations Manual (WSOM), draft Chapter B-45, Upper Air Operations. The following paragraphs provide general safety guidance on the handling of compressed hydrogen.

a. Hydrogen containers shall comply with the DOT specifications or ASME Boiler and Pressure Vessel Code, Section VIII.

b. Each container shall be marked with the name "Hydrogen."

c. Only spark-proof tools shall be used in and around hydrogen environment.

d. A static dissipative mat shall be placed at the end of inflation table in the Upper Air Building to prevent static electricity buildup when filling balloons.

e. Hydrogen storage areas shall be permanently placarded as follows: "DANGER-HYDROGEN-NO SMOKING" (ASN P810-3).

f. Bottled hydrogen cylinders shall be kept within the storage room.

g. Hydrogen systems shall be located so that they are readily accessible to delivery equipment and to authorized personnel.

h. Manifold systems shall not be used with compressed hydrogen. Only helium systems may be manifolded.

i. Safety posters shall be prominently displayed in the inflation room and cylinders storage area. The entire set of five posters can be ordered from NLSC using ASN P810-4:

P810-4A - General rules for hydrogen fire prevention

P810-4B - Safety rules for hydrogen cylinders

P810-4C - Balloon rupture procedures

P810-4D - Hydrogen-fed fires

P810-4E - Non-hydrogen fires

j. A limited number of hydrogen cylinders should be stored on site. This should be limited to 15 cylinders (or no more than 3,000 cu feet of hydrogen). Any exception to this should be approved by Regional or National Safety Officer.

k. At least two fire extinguishers shall be placed in Upper Air building inflation room. One of these two extinguishers shall be at least 20-lbs and be placed near the exit of inflation room. Additional fire extinguishers shall be placed in the cylinder storage room and radome.

9.3.6 Hydrogen Generator Systems

a. Only personnel completed the Hydrogen Generator training course shall perform operations and maintenance on such units.

b. Operators will use static dissipative mats to prevent static electricity buildup between the operator and gas lines with filling balloons and between the operator and the hydrogen generator when operating or performing routine maintenance.

c. Hydrogen Generator Systems areas shall be permanently placarded as follows: "HYDROGEN-FLAMMABLE GAS-NO SMOKING-NO OPEN FLAMES."

d. There shall be no use of electric tools or power equipment while operating the hydrogen generator. The area should be monitored for hydrogen gas prior to maintenance. Telephones, flashlights, pagers, etc. shall not be used unless intrinsically safe.

e. All electrical connections shall conform with 29 CFR 1910, Subpart S, for Class 1 Division 2 specifications.

f. The High Pressure Storage Tank shall not be filled to more than 100 psi. The tank shall be regularly drained to prevent a buildup of condensate.

9.4 Quality Control

9.4.1 Regional or Operating Unit Environmental/Safety Coordinators

a. Shall perform an annual assessment of the regional headquarters facilities or operating unit to monitor and promote compliance with the requirements of this procedure.

b. Shall perform assessments or designate personnel to perform assessments of all field offices to monitor and promote compliance with the requirements of this procedure every two years.

9.4.2 Station Manager

Shall review or delegate review, of this procedure on an annual basis to ensure that the facility is complying with its requirements. Confirmation of this review shall be forwarded to the Regional or Operating Unit Environmental/Safety Coordinator.

9.4.3 NWS Headquarters (NWSH)

a. The NWS Safety Office shall perform an annual assessment of the NWSH facilities to ensure that the facilities are in compliance with this procedure.

b. The NWSH Safety Office shall periodically perform an assessment of the regional headquarters and field offices to ensure compliance with this procedure. The frequency of these regional and field office assessments shall be determined by the NWSH Safety Office.

c. Requests for clarification concerning this procedure shall be directed to the NWSH Safety Office.

9.5 Responsibilities

9.5.1 Regional or Operating Unit Environmental/Safety Coordinators*

Shall monitor and coordinate to promote compliance with the requirements of this procedure for the regional headquarters, and field offices or operating units.

9.5.2 Station Manager*

a. Shall have oversight over the implementation of this procedure and ensure that the requirements of this procedure are followed by individuals at the NWS facility.

b. Shall ensure that required initial and refresher training is given to those employees working with compressed gas cylinders and training records are maintained.

c. Shall ensure that fire extinguisher training is provided if Emergency Action Plan (EAP) calls for employees to fight the fire.

d. Shall ensure compliance with all federal, state and local regulations and policies associated with compressed gas cylinders used at NWS facilities.

9.5.3 Safety or Environmental/Safety Focal Point*

a. Shall ensure that any responsibilities delegated to them by the Station Manager are implemented in accordance with the requirements of this procedure.

b. Shall ensure that Material Safety Date Sheets (MSDS) are available for all gases utilized at the site.

c. Shall ensure that warning signs are obtained and posted.

9.5.4 Employees

a. Individual employees affected by this procedure are required to read, understand and comply with the requirements of this procedure.

b. Report unsafe or unhealthful conditions and practices to their supervisor or safety focal point.

NOTE: * - Reference WSOM Chapter A-45 for complete list of responsibilities.

9.6 References

Incorporated References. The following list of references is incorporated as a whole or in part into this procedure. These references can provide additional explanation or guidance for the implementation of this procedure.

9.6.1 American National Standards Institute, ANSI 248.1-1954, Marking Portable Compressed Gas Containers to Identify the Material Contained.

9.6.2 American National Standards Institute, ANSI B31.1-1967, Industrial Gas and Air Piping.

9.6.3 American National Standards Institute, ANSI UL 407-1995, Standards for Safety Manifolds for Compressed Gases.

9.6.4 American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code, Section VIII.

9.6.5 Federal Meteorological Handbook, No. 3.

9.6.6 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.101, Compressed Gases (general requirements).

9.6.7 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.102, Acetylene

9.6.8 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.103, Hydrogen

9.6.9 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.104, Oxygen.

9.6.10 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.253, Oxygen-Fuel Gas Welding and Cutting.

9.6.11 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910, Subpart M, Compressed Gases and Compressed Air Equipment.

9.6.12 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910, Subpart S, Electrical.

9.6.13 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1926.153, Liquified Petroleum Gases.

9.6.14 U.S. Department of Transportation, 49 CFR 173.34 “Qualifications, Maintenance and Use of Cylinders.

9.6.15 WSOM draft Chapter B-45, Upper Air Operations.

9.6.16 WSOH-10, Rawisonde Observations.

9.7 Attachments

None